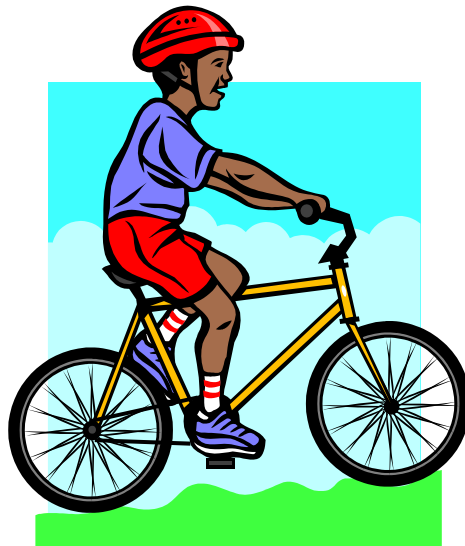


## Chapter 2 Project – Traveling with Graphs

### Description of the problem

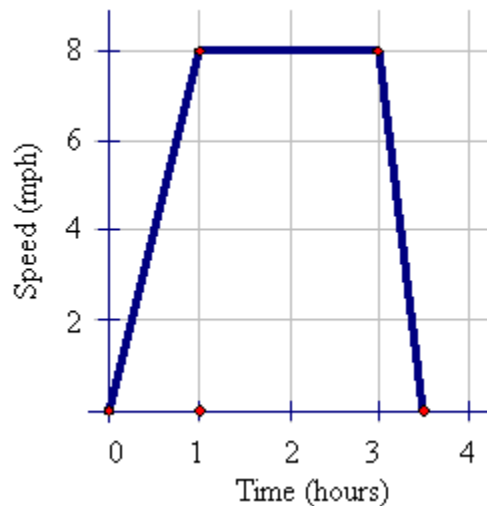
Carl has been studying the use of graphs in his algebra class. The teacher said that speed/time graphs could be used as models to find the distances covered during a trip, but she did not explain how this could be done. Carl enjoys bike riding. He frequently takes long rides and has a speedometer on his bike. He decides to experiment, and during his next bike ride, he collects speed/time data for the trip. On returning home, he graphs it to see how he might find the distance he traveled.



Carl's bike trip takes 3.5 hours. During each hour of the trip, Carl notes the speed at which he is traveling. The trip is over level ground, and for most of the trip Carl maintains a constant speed, since he is a good rider. His data are as follows:

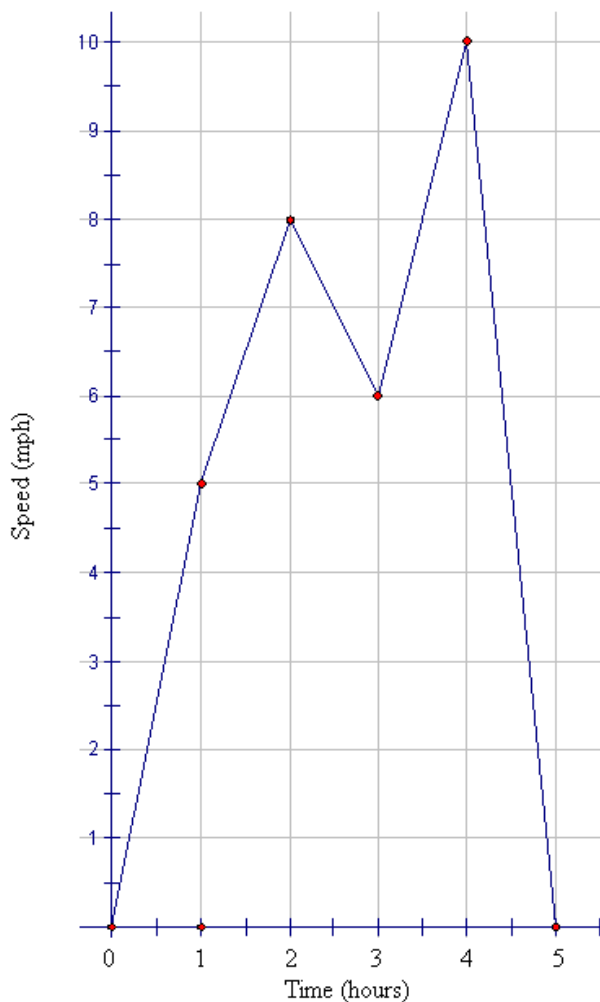
Hours	0	1	2	3	3.5
Speed (mph)	0	8	8	8	0

For these data, he plots a speed/time graph.



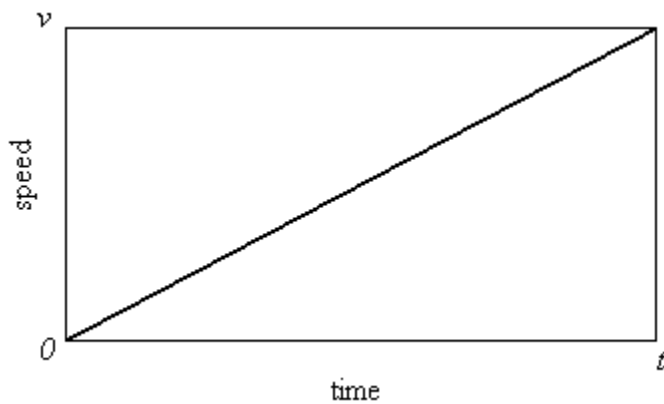
Carl knows the distance formula,  $d = rt$ , so for the two hours he traveled at 8 mph, he computes 16 miles. What does this have to do with the graph? Then he realizes that the area of the region of the graph between 1 and 3 hours, that is, the time when he maintained 8 mpg, is equal to 16 square units. *Thus, the area under a speed/time graph represents distance.*

1. Use this principle to find the distances traveled during the first hour and last half hour.
2. According to the graph, what was Carl's speed at the end of thirty minutes?
3. What is the total distance covered during this trip?
4. During a five-hour bike ride, Carl again collects speed/time data and graphs it below.



What is the total distance Carl traveled during this ride?

5. The time during which a body has a constant increase in velocity is called a period of acceleration, and the body is said to be accelerating. What are the periods of acceleration for the two trips discussed?
6. A period during which a body has a constant decrease in velocity is called a period of deceleration, and the body is said to be decelerating. What are the periods of deceleration for the two trips?
7. Assume that during a period of time,  $t$ , a body accelerates in speed until it reaches a velocity,  $v$ . The graph of this situation is as follows.



Write a formula in terms of  $t$  and  $v$  that will give the distance traveled during a time period.